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Environmental Protection Division
Water Quality & RCRA Group (ENV-RCRA)
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Date: **DEC 10 2012**
Refer To: ENV-RCRA-12-0264
LAUR: 12-26750

Ms. Hannah Branning
U.S. Environmental Protection Agency, Region 6
Compliance Assurance and Enforcement Division
Water Enforcement Branch (6EN)
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Dear Ms. Branning:

**SUBJECT: LOS ALAMOS NATIONAL LABORATORY, NATIONAL POLLUTANT
DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT NO. NM0028355,
TOXICITY REDUCTION/HARDNESS ADDITION STUDY PROGRESS REPORT
UPDATE**

The U. S. Department of Energy (DOE) and Los Alamos National Security, LLC (LANS) previously submitted the Toxicity Reduction Evaluation (TRE) Action Plan and Schedule on January 31, 2008 as a result of failed whole effluent toxicity (WET) tests at the Los Alamos National Laboratory (LANL), Technical Area 50, Radioactive Liquid Waste Treatment Facility (RLWTF), Outfall 051. The required quarterly status reports were submitted to the U.S. Environmental Protection Agency (EPA), Region 6, after that date. On March 2, 2010, DOE/LANS submitted the Final Report on TRE activities.

As previously reported to EPA (reference ENV-RCRA-12-0185 dated August 27, 2010), the first phase of the toxicity reduction/hardness addition study evaluated the effects of restoring hardness (as calcium carbonate (CaCO₃) equivalent) to natural levels present in LANL potable water at the WET testing laboratory. From December 13, 2011 through June 18, 2012 a total of 26 EPA acute toxicity tests with *Daphnia pulex* have been performed on treated RLWTF water. These analyses were performed by Pacific EcoRisk (PER) located in Fairfield, California. Thirteen samples of

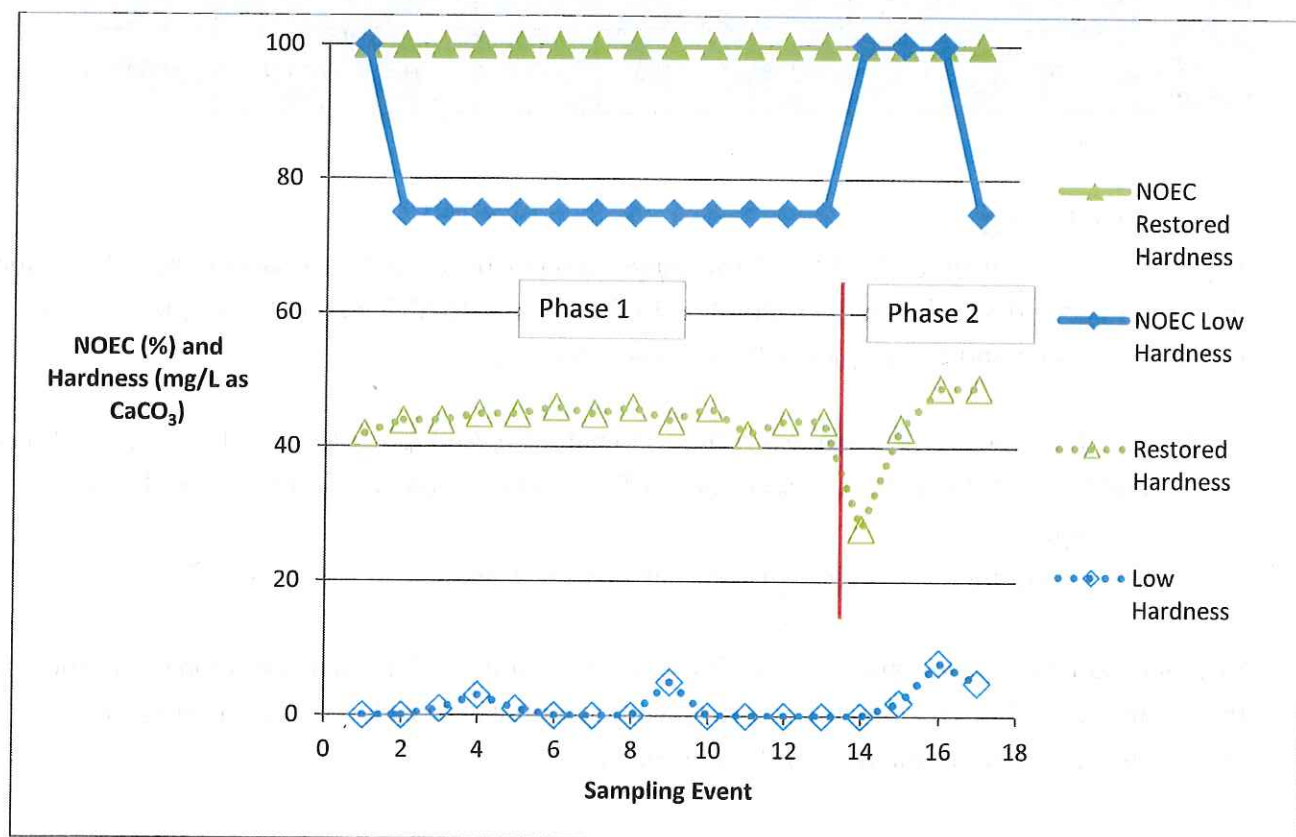
treated RLWTF water were sent to PER during this time period. Each sample underwent two independent WET tests. One WET test was performed on the treated RLWTF water sample which is very low in hardness. The second WET test was performed on the treated RLWTF water sample after hardness was restored to between 40 and 50 mg/L as CaCO_3 , the hardness of the potable water supply, per EPA guidance. Results of this first phase side-by-side WET testing study strongly indicated that the restoration of hardness to the treated RLWTF water removed toxicity from the water.

The purpose of this progress report is to update EPA on the results of the second phase of the toxicity reduction/hardness addition studies performed at the RLWTF during October 2012. The second phase of the toxicity reduction/hardness addition study evaluated the effect of restoring hardness to natural levels found in the potable water supply, full-scale, at the RLWTF in four separate sampling events. The following protocol was followed during the second phase of full-scale testing for each of the four sampling events:

- The RLWTF effluent tank was filled to 25% full with typical, low-hardness treated water.
- The tank was mixed and the low-hardness water was sampled.
- Hardness was restored to the water in the tank by adding magnesium chloride and calcium chloride at the molar proportions established for EPA synthetic freshwater in the EPA test guidelines (reference: "Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, Fifth Edition" (EPA-821-R-02-012)). The target hardness was 40-48 mg/L as CaCO_3 .
- The tank was thoroughly mixed again and the restored hardness water was sampled.
- The two samples (one with low-hardness and one with restored hardness) were shipped overnight to PER for WET testing.
- The RLWTF effluent tank was emptied and flushed with low-hardness treated water in preparation for the next sampling event.

The four separate sampling events occurred during the weeks of October 8, 15, 22 and 29, 2012. Thus, a total of eight (8) EPA acute toxicity tests with *Daphnia pulex* have been performed during this second phase study. For each sampling event, one WET test was performed on the treated RLWTF water sample which is very low in hardness and the second WET test was performed on the treated RLWTF water sample after hardness had been restored to between 40 and 50 mg/L as CaCO_3 . The results of this Phase 2 side-by-side WET testing study also indicate, as did the results from the Phase 1 study, that the restoration of hardness to the treated RLWTF water removed toxicity from the water.

The following figure demonstrates the reduction of toxicity in treated RLWTF water by the restoration of hardness to the natural levels found in the potable water during the two phases. The first 13 sampling events occurred during the Phase 1 study. The Phase 2 study consisted of the last four sampling events. A sample having a 100% "no observable effect concentration" (NOEC) shows no toxicity, in an undiluted sample, to the *Daphnia pulex* organism. To pass the WET test the NOEC must be 100%.



The following table shows analytical data for calcium, magnesium, copper and zinc in the low-hardness and restored hardness samples collected in the Phase 2 work completed in October 2012 [note that Ca/Mg units are parts per million (ppm) and the Cu/Zn units are parts per billion (ppb)].

	Oct. 8		Oct. 15		Oct. 22		Oct. 29	
	Low Hardness	Restored Hardness	Low Hardness	Restored Hardness	Low Hardness	Restored Hardness	Low Hardness	Restored Hardness
Ca (ppm)	0	4.7	0.02	6.7	0.43	7.4	0.18	6.9
Mg (ppm)	0.003	3.9	0.17	5.8	0.43	6.3	0.22	5.7
Cu (ppb)	7.2	3.9	0.95	1.3	3.7	2.8	7.3	6.4
Zn (ppb)	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	1.4	0.64

Summary of Results:

Beginning in December 2011, 34 WET tests have been performed in two phases to investigate the effect on toxicity due to hardness restoration in the treated RLWTF water (17 samples without hardness restored and 17 samples with hardness restored).

1. All 17 samples, with hardness restored to natural LANL potable water levels, in the Phase 1 and Phase 2 efforts have passed the WET test, which indicates that the water had no toxicity.
2. Thirteen of the 17 samples, without hardness restored, failed the WET test.

In conclusion, the Phase 1 and Phase 2 efforts strongly indicate that the restoration of hardness in the treated RLWTF water, to natural levels, would significantly reduce, and perhaps totally eliminate, the toxicity of the treated RLWTF water.

The DOE/LANS' NPDES permit expired on July 31, 2012 and was administratively continued until a new permit is issued by EPA. Ultimately, it is the intention of DOE/LANS to request, based upon the WET testing efforts just completed, that the EPA permit writer use the hardness concentration of 40-50 mg/l as CaCO₃ in the evaluation of reasonable potential for the development of metal effluent limits. Additionally, the Permittees request that this letter be part the administrative record for permit development of NPDES Permit No. NM0028355.

Please contact Marc Bailey, LANS at (505) 665-8135 or Gene Turner, DOE at (505) 667-5794 if you need additional information concerning the status of the Laboratory's corrective action activities.

Sincerely,



Robert S. Beers
Water Quality Permitting and Compliance Team Leader (Acting)
Water Quality & RCRA Group (ENV-RCRA)
Los Alamos National Security, LLC

RSB:MB/lm

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